

1 WHAT IS CLAIMED IS:

1. A load balancing system for network nodes, the load balancing system comprising:

5 a plurality of crossbar devices;

a plurality of queues configured to receive data; and

10 a load balancer coupled to the plurality of queues and configured to determine an amount of data in each of the plurality of queues and to send the data to specific ones of the plurality of crossbar devices based on the amount of data in each queue.

15 2. The load balancing system of claim 1 wherein the plurality of queues comprises a high priority queue and a plurality of non-high priority queues.

20 3. The load balancing system of claim 2 wherein the load balancer sends data to specific crossbar devices of the plurality of crossbar devices based on an amount of data in the high priority queue relative to an amount of data in each of the plurality of non-high priority queues.

25 4. The load balancing system of claim 2 wherein the load balancer sends data to specific crossbar devices in a order that is based on one of the amount of data in the high priority queue and an amount of data in each of the plurality of non-high priority queues.

30 5. The load balancing system of claim 2 wherein the load balancer sends data to specific crossbar devices of the plurality of crossbar devices based on an amount of data in each of the plurality of non-high priority queues relative to an amount of data in the high priority queue.

1 6. The load balancing system of claim 2 wherein the
load balancer sends data to specific crossbar devices in a
order based on one of an amount of data in the high priority
5 queue and an amount of data in each of the plurality of non-
high priority queues.

 7. The load balancing system of claim 1 further
comprising a capacity indicator identifying the amount of data
10 in each queue.

 8. The load balancing system of claim 7 wherein the
load balancer is configured to determine the amount data in
each queue based on examining the capacity indicator and to
15 transmit data to the plurality of crossbar devices in a
predetermined order based on the examination of the capacity
indicator.

 9. The load balancing system of claim 7 wherein the
capacity indicator further indicates an occupancy level based
20 on the amount of data in each queue.

 10. The load balancing system of claim 9 wherein load
balancer is configured to transmit data to the plurality of
25 crossbar devices in a predetermined order based on various
occupancy levels of each queue as indicated by the capacity
indicator.

 11. The load balancing system of claim 10 wherein the
30 occupancy levels are high, medium, low and empty.

 12. The load balancing system of claim 1 wherein each of
the queues are divided into a plurality of portions having a
corresponding portion indicator for each portion of the queues
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1 to identify that data are in a corresponding portion of a queue.

5 13. The load balancing system of claim 12 wherein the portion indicators are modifiable to indicate various occupancy levels in the queue.

10 14. The load balancing system of claim 12 wherein the load balancer is configured to transmit data from the plurality of queues to the plurality of crossbar devices in a predetermined order based on the portion indicators.

15 15. The load balancing system of claim 2 wherein each of the queues are divided into a first portion, a second portion and a third portion.

20 16. The load balancing system of claim 15 wherein the data received are placed first in the first portion, when the first portion is full, the received data are placed in the second portion and, when the second portion is full, the received data are placed the third portion of the queue.

25 17. The load balancing system of claim 15 wherein the load balancer, upon determining that data are in the third portion of the queue of the high priority queue, causes the data in the high priority queue to be transmitted to all the plurality of crossbar devices that are available.

30 18. The load balancing system of claim 15 wherein the load balancer, upon determining that data are in the first portion of the queue of the high priority queue, causes the data in the third portion of the non-high priority queues to be transmitted to all the plurality of crossbar devices that are available.

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1 19. The load balancing system of claim 15 wherein the
load balancer, upon determining that data are only in the non-
high priority queues, causes the data in the non-high priority
5 queues to be transmitted to all the plurality of crossbar
devices that are available.

10 20. The load balancing system of claim 15 wherein the
load balancer, upon determining that data are only in the high
priority queues, causes the data in the high priority queues
to be transmitted to all the plurality of crossbar devices
that are available.

15 21. The load balancing system of claim 15 wherein the
load balancer, upon determining that data are in one of the
first and second portions of the queue of the high priority
queue, causes the data in the non-high priority queues to be
transmitted to particular predetermined crossbar devices that
are available and causes the data in the high priority queue
20 to be transmitted to remaining crossbar devices from the
plurality of crossbar devices that are available.

22. The load balancing system of claim 15 further
comprising:

25 a first indicator identifying that data are in the first
portion of a queue;

 a second indicator identifying that data are in the
second portion of a queue; and

 a third indicator identifies that data are in the third
30 portion of a queue.

23. The load balancing system of claim 15 wherein the
load balancer, upon determining that the third indicator
identifies that data are in the third portion of the queue of
35 the high priority queue, causes the data in the non-high

1 priority queues to be transmitted to all the plurality of
crossbar devices that are available.

5 24. The load balancing system of claim 1 wherein the
load balancer is configured to detect inoperable crossbar
devices.

10 25. The load balancing system of claim 24 wherein the
load balancer in detecting inoperable devices comprises
sending a message to the plurality of crossbar devices and
receiving a response sent from each of the plurality of
crossbar devices that are operating.

15 26. The load balancing system of claim 24 wherein the
load balancer in detecting inoperable devices comprises
sending a message to the plurality of crossbar devices and
determining if a response sent from each of the plurality of
crossbar devices that are operating based on a predetermined
20 time frame.

25 27. The load balancing system of claim 24 wherein the
load balancer is configured to detect additional crossbar
devices added to the plurality of crossbar devices.

30 28. The load balancing system of claim 27 wherein the
load balancer in detecting additional crossbar devices
comprises sending a data to at least one predetermined
location and receiving a response sent from each of the
additional crossbar devices that are added.

35 29. The load balancing system of claim 27 wherein the
load balancer in detecting additional crossbar devices
comprises receiving a data sent from each of the additional
crossbar devices that are added.

1 30. The load balancing system of claim 25 wherein the predetermined location is an offset from one of the plurality of crossbar devices.

5 31. The load balancing system of claim 1 further comprising a processor coupled to the load balancer.

10 32. A load balancing method comprising:
receiving a plurality of data;
storing the plurality of data in a plurality of queues,
each data of the plurality of data being placed in a specific
queue of the plurality of queues based on a priority
associated with each data;
15 determining occupancy levels in each of the plurality of queues; and
transmitting the data to a plurality of crossbar devices
based on the determined occupancy levels in each queue.

20 33. The load balancing method of claim 32 wherein the plurality of queues comprises a high priority queue and a plurality of non-high priority queues.

25 34. The load balancing method of claim 33 wherein the occupancy levels in each queue are based on an amount of data in the high priority queue and an amount of data in each of the plurality of non-high priority queues.

30 35. The load balancing method of claim 33 wherein transmitting the data, the data are transmitted to specific crossbar devices in an order that is based on an occupancy level of the high priority queue and an occupancy level in each of the plurality of non-high priority queues.

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1 36. The load balancing method of claim 32 further
comprising dividing the queues into a plurality of portions
having a corresponding portion indicator for each portion of
5 the queues to identify that data are in a corresponding
portion of a queue.

10 37. The load balancing method of claim 32 further
comprising modifying the portion indicators to indicate
various occupancy levels in the queue.

15 38. The load balancing method of claim 32 wherein
transmitting the data, the data are transmitted to specific
crossbar devices in an order based on the portion indicators.

20 39. The load balancing method of claim 33 further
comprising:

dividing each of the queues into a first portion, a
second portion and a third portion; and

25 determining if data are in the first, second and third
portions of the plurality of queues.

30 40. The load balancing method of claim 39 wherein the
transmitting of the data further comprises transmitting the
data in the high priority queue to all the plurality of
crossbar devices, upon determining that data are in the third
portion of the queue of the high priority queue.

35 41. The load balancing method of claim 39 wherein the
transmitting of the data further comprises transmitting the
data in the third portion of the non-high priority queues to
all the plurality of crossbar devices, upon determining that
data are in the first portion of the queue of the high
priority queue.

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42. The load balancing method of claim 39 wherein the
transmitting of the data further comprises transmitting the
data in the non-high priority queues to all the plurality of
5 crossbar devices, upon determining that data are only in the
non-high priority queues.

43. The load balancing method of claim 39 wherein the
transmitting of the data further comprises transmitting the
10 data in the high priority queues to all the plurality of
crossbar devices, upon determining that data are only in the
high priority queues.

44. The load balancing method of claim 39 wherein the
15 transmitting of the data further comprises transmitting the
data in the non-high priority queues to particular
predetermined crossbar devices and transmitting the data in
the high priority queue to remaining crossbar devices from the
plurality of crossbar devices, upon determining that data are
20 in one of the first and second portions of the queue of the
high priority queue.

45. The load balancing method of claim 32 further
comprising detecting one of inoperable crossbar devices and
25 operable crossbar devices and transmitting data to the
crossbar devices based on the detecting of one of inoperable
crossbar devices and operable crossbar devices.

46. The load balancing method of claim 32 further
30 comprising detecting an operational condition of each of the
plurality of crossbar devices and transmitting data to the
crossbar devices based on the operational condition detected.

47. The load balancing method of claim 32 further
35 comprising detecting additional crossbar devices added to the

1 plurality of crossbar devices and transmitting the data to the
detected additional crossbar devices.

5 48. A load balancing system comprising:
switching element means;
first holding means for receiving and storing high
priority data;
second holding means for receiving and storing non-high
10 priority data; and
balancing means for determining an occupancy level of the
first and second storing means and sending data to specific
switching element means based on the determined occupancy
level of the first storing means in relation to the determined
15 occupancy level of the second storing means.